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Review article

DIABETES MELLITUS TYPE 2 - THE IMPORTANCE OF HEALTH EDUCATION OF PATIENTS: A REVIEW

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Abstract: Diabetes mellitus (DM) represents a significant public health problem, and Type 2 Diabetes Mellitus (DM2) is the most common form of this disease, accounting for about 90% of all DM cases worldwide. The prevalence of DM2 has reached pandemic proportions, especially in developed countries. Studies have shown that a low level of health literacy among patients with DM2 can be a significant predictor of premature death, disability, and increased healthcare costs. It is important to emphasize patient education to reduce mortality and improve the quality of life for DM2 patients. This review is based on a search of scientific literature, focusing on original research articles and meta-analyses found in scientific databases such as PubMed, SCOPUS, MEDLINE, and SCI Index, all published within the last ten years. The search focused on topics related to the public health issue of DM2 and the health literacy of affected individuals. Key terms used in the search included diabetes mellitus, Type 2 diabetes mellitus, prevention, health education, public health, risk factors, and others. Studies have shown that a low level of health literacy among DM2 patients can significantly increase the risk of premature death and disability, as well as healthcare costs. It is crucial to emphasize patient education to reduce mortality and improve the quality of life for DM2 patients.

Keywords: Diabetes mellitus, risk factors, obesity, cardiovascular disease, prevention, education.

INTRODUCTION

DM is a significant public health problem, leading to severe complications due to inadequate glucose regulation and control, which causes considerable disability, mortality, and economic consequences for both individuals and countries (1, 2). DM is a metabolic disorder characterized by persistent hyperglycemia (3). Today, DM is one of the leading causes of death from chronic non-communicable diseases (3). The importance of this disease lies in its potential to cause numerous complications, leading to increased morbidity and mortality (3, 4). DM2 is the most common form of this disease, making up about 90% of all DM cases globally (5). The prevalence of DM2 has reached pandemic levels, especially in developed countries (6). DM2 results from mutations in multiple genetic loci and the involvement of about 250 polymorphic genes. Genetic predisposition does not always lead to disease development, but favorable conditions, such as reduced physical activity, obesity, and aging, can accelerate the onset of the disease (7, 8). In terms of complications, DM2 has become a significant cause of morbidity and mortality in European countries, leading to persistent economic and individual burdens of diabetes (9, 10). The World Health Organization (WHO) and the International Diabetes Federation estimate that in 2019, 463 million people globally were affected by DM, and that number is expected to rise to 700 million by 2045 (11). Studies suggest that in 2015, the global prevalence of DM2 was 8.8%, with an anticipated increase to 10.4% by 2040 (12, 13). This paper aims to provide an overview of the significance of DM and its threat to public health, as well as the importance of health literacy for DM2 patients. It is evident that in recent years, a younger population has been increasingly affected by this disease. This highlights the importance of early preventive measures and the need for information dissemination, particularly for healthcare professionals like nurses, who play a crucial role in patient education, prevention, diagnosis, treatment, and care, especially in preventing disease and educating patients with DM2.

METHODOLOGY

This review is based on a search of scientific literature, with a particular focus on original research

articles and meta-analyses available in scientific databases such as PubMed, SCOPUS, MEDLINE, and SCI Index, published within the last ten years. The search focused on topics related to the public health issue of DM2 and health literacy among patients. Key search terms included diabetes mellitus, Type 2 diabetes mellitus, prevention, health education, public health, and risk factors.

Type 2 diabetes mellitus as a public health problem

Globally, the WHO DIAMOND project registers show that in high-income countries, the prevalence of Type 2 diabetes is highest among the poorest individuals, though some data indicate a reversal of this trend in middle-income countries (14, 15). A significant point to highlight is the variation in undiagnosed Type 2 diabetes from region to region. Data from seven countries have shown that diabetes is undiagnosed and untreated in 24% to 62% of individuals (14, 15). The literature suggests that complications of DM are significantly more common than other chronic non-communicable diseases if not recognized in time, and people with lower health literacy are more prone to complications (14, 15). DM2 is a chronic health condition that is reaching alarming global rates, and a healthy population is an important indicator of health culture (15-17). Persistently high blood sugar levels over time can cause significant damage to individual organs (15, 16).DM has become one of the leading public health problems of the 21st century, and WHO projects that by 2025, 200–300 million people worldwide will be affected by the disease, leading to around 6 million new cases annually (according to the Centers for Disease Control and Prevention – CDC) (18). The highest prevalence of DM2 is found in Southeast Asia. In the United States, DM2 is the sixth leading cause of death among all diseases, and third in some ethnic populations (18). The emergence of DM2 is linked to changes in lifestyle and the increasing standard of living in many Western European countries and the United States. Key risk factors include genetic predisposition and environmental factors. Among the main causes of this disease are obesity (particularly visceral obesity), lack of or reduced physical activity, sedentary lifestyle, poor diet and food preparation, and perinatal factors (19). Globally, approximately 540 million adults (one in 11) live with diabetes, and by 2045, this number is expected to rise to 783 million (one in eight adults) (20, 21). Incidence of DM2 increases with age, with the highest rates occurring between 55 and 59 years, slightly earlier in men than in women (16). Over the past three decades, there have been no major changes in the age distribution of DM2 incidence or prevalence, but with the rising obesity epidemic, there is an expectation that younger age groups with risk factors will increasingly be affected by DM2 (22-24). DM2 is a leading risk factor for ischemic cerebrovascular disease or stroke. Studies have shown that the pathophysiology of strokes and transient ischemic attacks in people with DM2 complications is due to cerebral hemodynamic and vascular disturbances, hyperglycemia, and other associated risk factors. One of the most common complications of DM2 is diabetic polyneuropathy, which can exist with or without neuropathic pain. Its incidence increases with the duration of diabetes. About 50% of patients with DM2 suffer from this condition, compared to around 30% with Type 1 diabetes (DM1). These complications significantly reduce quality of life, shorten life expectancy, and further increase the already rising cost of diabetes treatment (25). It has been proven that the etiopathogenic mechanism of strokes and transient ischemic attacks in individuals with complications from DM2 is a consequence of cerebral hemodynamic and vascular disorders, hyperglycemia, and other associated risk factors in the older population with DM2 (26).

The importance of health literacy in people with type 2 diabetes mellitus

Health literacy is a crucial determinant of health in a population and serves as a foundation for responsible individual and family behavior in managing chronic conditions. The European Union (EU) recognizes the importance of health literacy for improving healthcare across the EU. According to WHO, health literacy is an indicator of a country's health status. Literature suggests that individuals with lower health literacy are more prone to complications from diabetes and more likely to use healthcare services than informed and health-literate patients (14, 15). As DM2 is a chronic health condition reaching alarming global rates, health literacy serves as an important indicator of population health (15-17). Persistent high blood sugar over time can cause damage, dysfunction, or loss of function in various organs, most commonly the heart and blood vessels, kidneys, and nervous system. The complications of DM2 are inevitable, but early disease recognition, self-monitoring, balanced diet, and physical activity can significantly help delay complications (15, 16). The study by Poulimeneas D and colleagues showed that knowledge about DM2 improves blood sugar control and is associated with several demographic parameters. Greece is a country with a high obesity rate, and knowledge about the disease had never been evaluated in diabetics before this study. The aim of this

study was to assess knowledge about DM2. The questionnaire on disease knowledge was correlated with blood glucose levels and sociodemographic characteristics of the participants, showing poor knowledge of the disease (mean DKT score 8.3 ± 2.2/14.0 and mean DKT as a percentage of correct answers 59.6 ± 15.8%). This study showed the urgent need for training and education for patients with DM2 in Greece to improve disease outcomes (27). In the study by Bains SS and colleagues, who assessed knowledge among patients in primary healthcare, participants filled out survey questionnaires related to their knowledge of their own disease, health literacy, diabetes knowledge, and self-care (28). The majority of the sample in this study was younger than 65 years, and it was found that health literacy influences the course of the disease and complications through diabetes knowledge (28). The meta-analysis by Marciano L and colleagues focused on quantitative findings about the relationship between health literacy and diabetes knowledge, self-management activities, and blood glucose control outcomes related to the disease and the assessment of health literacy. Key studies included patients with type 1 (DM1) and/or type 2 diabetes aged 18 or older and provided an estimated effect size for functional health literacy and diabetes knowledge, self-management activities, or HbA1C. This meta-analysis included a total of 61 studies with 18,905 patients. Most of these studies were conducted in the United States on patients with type 2 diabetes, using S-TOFHLA as a measure of functional health literacy based on performance or BHLS as a measure based on perception. The results showed that all three outcomes were associated with health literacy. This study concluded that the health literacy of patients with DM2 plays a significant role in diabetes knowledge (29). As for DM2, a large number of studies assessing the relationship between health literacy and diabetes knowledge concluded that the connection between health literacy and diabetes is crucial for the prevention of complications (30-32). The study by Santa Cruz-Álvarez P and colleagues suggests that developing educational programs for adolescents with DM2 transitioning from pediatric to adult care is important for maintaining blood glucose control and emotional well-being, which are key predictors for the prevention and delay of complications from hyperglycemia in individuals with DM2 (33). The study by Fernández-Duque MV and colleagues suggests that patient education for DM2 should be included in primary healthcare institutions, where there are five pillars of DM2 treatment, and patients need to be educated about nutrition, exercise, self-monitoring of blood glucose, medications, and controlling vascular risk factors for DM2 complications (34). Studies suggest that health literacy in patients with DM2 has a small but significant impact on better blood glucose control, measured by HbA1C (35-37). The fundamental role in developing appropriate educational and health programs about diabetes primarily falls to nurses based on the analysis of learning needs and patient characteristics. These health literacy education programs for DM2 patients could reduce or prevent complications associated with this widespread chronic disease. One of the leading aspects that should be considered is that patients with diabetes mellitus should be committed to proper nutrition, which should exclude foods containing simple sugars. This is because the progression of DM2 leads to certain acute or chronic complications, most often in the blood vessels and nerves. Unfortunately, due to the unpredictable nature of this disease, many patients remain undiagnosed until serious complications appear, which significantly impact premature mortality and disability in individuals with DM2. This also represents a major public health issue (38-42). In Table 1, we present a brief overview of some of the relevant studies that we analyzed in review paper.

Table 1. *Systematic reviews of papers published in 8 journals in the last 10 years*

Reference	Publication Year	Journal
Marciano LYesilbas [29]	2019	J Gen Intern Med
Ogurtsova Ket al[30]	2017	Diabetes Res ClinPract
Santa Cruz-Álvarez Pet al[33]	2024	Endocrinol Diabetes Nutr
Gomes MB[35]	2018	Patient Prefer Adherence
Kueh YC[36]	2017	Psychol Health Med
Kueh YC[37]	2015	Health Qual Life Outcomes
Alhaik S[38]	2019	Diabetes MetabSyndr.
Zowgar AM[39]	2018	Saudi Med J.

CONCLUSION

As the number of diabetes cases continues to grow rapidly and patients live longer, healthcare systems will face increasing challenges inmeeting their needs. Therefore, new and less resource-intensive care models for diabetes are necessary to address this rising demand. Given that nearly half of the adult population is expected to develop diabetes during their lifetime, advances in diabetes outcomes will soon be outpaced by the sheer number of people requiring care. Primary prevention strategies are urgently needed. Strong evidence has shown that diabetes can be prevented through lifestyle changes, and the role of healthcare professionals, particularly nurses, in educating the population and providing health education at all levels of healthcare, with an emphasis on primary care, is crucial to detect this disease early and prevent complications. Only a population-based prevention approach can address this scale of the problem. Prevention strategies should include optimizing urban planning, food marketing policies, and creating work and school environments that allow individuals to adopt healthier lifestyles. Studies have shown that a low level of health literacy among DM2 patients is a significant predictor of premature death, disability, and increased healthcare costs. Therefore, it is important to focus on patient education to reduce mortality and improve the quality of life for DM2 patients.

Abbreviations

CDC - Centers for Disease Control
DM - Diabetes mellitus
DM1 - Diabetes mellitus type 1.
DM2 - Diabetes mellitus type 2.
EU- European Union
WHO - The World Health Organization

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Sažetak

DIJABETES MELITUS TIP 2 - ZNAČAJ ZDRAVSTVENOG PROSVEĆIVANJA OBOLELIH: PREGLED

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Dijabetes melitus (lat. Diabetes mellitus, DM) predstavlja značajan javnozdravstveni problem, a Dijabetes melitus tip dva (DM2), je najčešći oblik ove bolesti koji čini oko 90% svih obolelih od DM u svetu. Učestalost DM2 ima pandemijske razmere, posebno u razvijenim zemljama. Studije u svetu su pokazale da je nizak stepen zdravstvene pismenosti bolesnika sa DM2 što može biti značajan prediktor za prerano umiranje i invaliditet i povećane troškove za negu i lečenje ovih bolesnika. Značajno je staviti akcenat na edukaciju bolesnika kako bi se smanjio mortalitet i poboljšao kvalitet života bolesnika sa DM2. Ovaj pregledni rad se temelji na pretraživanju naučne literature, sa posebnim fokusom na originalne naučne članke i metaanalize koje se nalaze u naučnim bazama podataka: PubMed, SCOPUS, MEDLINE i SCI index i druge, koje nisu starije od deset godina. Pretraživanje publikacija se odnosilo na temu vezano za javnozdravstveni problem DM2 i zdravstvenu pismenost obolelih. Za potrebe ovog članka koristili smo ključne reči: Dijabetes melitus, dijabetes melitus tip 2, prevencija, zdravstveno prosvećivanje, javno zdravlje, faktori rizika i druge. Studije u svetu su pokazale da je nizak stepen zdravstvene pismenosti bolesnika sa DM2 što može biti značajan prediktor za prerano umiranje i invaliditet i povećane troškove za negu i lečenje ovih bolesnika. Značajno je staviti akcenat na edukaciju bolesnika kako bi se smanjio mortalitet i poboljšao kvalitet života bolesnika sa DM2.

Ključne reči: Dijabetes Melitus, faktori rizika, gojaznost, kardiovaskularne bolesti, prevencija, edukacija.

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